

WHAT IS CLAIMED IS:

1. A method of manufacturing a liquid jet head including a passage-forming substrate which is made of a single crystal silicon substrate and in which at least one pressure generating chamber communicating with at least one nozzle orifice is defined, and at least one piezoelectric element which is provided on the passage-forming substrate through a vibration plate and made of a lower electrode, a piezoelectric layer and an upper electrode, the method comprising the steps of:

forming the vibration plate and the piezoelectric element on one surface of the passage-forming substrate;

thermally adhering a sealing plate which has a piezoelectric element holding portion for sealing the piezoelectric element therein, onto the passage-forming substrate;

processing the passage-forming substrate to have a predetermined thickness;

depositing an insulation film on other surface of the passage-forming substrate at lower temperature than that for adhering the passage-forming substrate and the sealing plate, and patterning the insulation film into a predetermined shape; and

etching the passage-forming substrate using the patterned insulation film as a mask to form the pressure generating chamber.

2. The method of manufacturing a liquid jet head according to claim 1, wherein an adhesive agent for adhering the passage-forming substrate and the sealing plate is an epoxy-based adhesive agent.

3. The method of manufacturing a liquid jet head according to claim 1, wherein at least a lowermost layer of the vibration plate is formed of a thermal oxide film and one surface of the pressure generating chamber

includes the thermal oxide film.

4. The method of manufacturing a liquid jet head according to claim 1, wherein one of an ECR sputtering method and an ion assisted deposition method is used in the step of forming the insulation film.

5. The method of manufacturing a liquid jet head according to claim 1, wherein in the step of forming the pressure generating chamber, an overhanging portion is formed by removing part of the passage-forming substrate in a region where the insulation film is formed so that the insulation film overhangs in a region corresponding to the pressure generating chamber, and

the method further comprising the step of removing the overhanging portion after the step of forming the pressure generating chamber.

6. The method of manufacturing a liquid jet head according to claim 1, wherein any one material of silicon nitride, tantalum oxide, alumina, zirconia, and titania is used as the insulation film.

7. The method of manufacturing a liquid jet head according to claim 6, wherein the insulation film is patterned by dry etching using etching gas which essentially contains one of tetrafluoromethane ( $\text{CF}_4$ ) and trifluoromethane ( $\text{CHF}_3$ ).

8. The method of manufacturing a liquid jet head according to claim 1, wherein in the step of processing the passage-forming substrate to have a predetermined thickness, the passage-forming substrate is treated with an etching solution on other surface thereof opposite to one surface thereof on which the piezoelectric element is provided, while the passage-forming substrate is rotated in an in-plane direction of the other side thereof.

9. The method of manufacturing a liquid jet head according to claim 8, wherein in the step of processing the passage-forming plate to have a

predetermined thickness, the other surface of the passage-forming substrate is treated with the etching solution after being ground or polished.

10. The method of manufacturing a liquid jet head according to claim 8, wherein the etching solution is made of hydrofluoric nitric acid.

11. The method of manufacturing a liquid jet head according to any one of claims 1 to 10, wherein each of the steps is conducted on a single crystal silicon wafer which is to be divided into the passage-forming substrates, and thereafter the single crystal silicon wafer is divided.

12. The method of manufacturing a liquid head according to any one of claims 1 to 10, further comprising the step of adhering a nozzle plate, in which at least one nozzle orifice is drilled, to the other surface of the passage-forming substrate in which the pressure generating chamber is formed.

13. The method of manufacturing a liquid head according to claim 11, further comprising the step of adhering a nozzle plate, in which at least one nozzle orifice is drilled, to the other surface of the passage-forming substrate in which the pressure generating chamber is formed.